

# **APPENDIX Q COST ANALYSES**

## **PROVIDENCE RIVER AND HARBOR MAINTENANCE DREDGING**



## **FINAL ENVIRONMENTAL IMPACT STATEMENT**



**U.S. ARMY CORPS OF ENGINEERS  
NEW ENGLAND DISTRICT**



**APPENDIX Q**  
**PROJECT COST ESTIMATE**  
**PROVIDENCE RIVER MAINTENANCE DREDGING**  
**PROVIDENCE, RHODE ISLAND**

**1. GENERAL**

This project consists of the work necessary to dredge the Providence River in RI and transport the dredged material to a disposal site or a handling facility. A construction cost estimate was prepared assuming the use of mechanical dredging equipment and the conceptual design for numerous disposal sites

**2. DREDGING AND MATERIAL HANDLING**

The mechanical dredging cost estimate including dumping at a cell or a disposal facility was performed using the Corps of Engineers Dredge Estimating Program (CEDEP). In addition to the dredging and open water disposal estimate, a cost estimate for upland disposal, including construction of the disposal facility and transportation was also performed. Engineering and Design (E&D) and Construction Management (S&A) costs have been provided by the Project Manager.

**3. DISPOSAL SITES**

a. Cell in Channel

Thirty percent of the total dredged material (1,200,000 CY) is estimated to be unsuitable for unconfined open water disposal for a 40 feet deep and 500/600 feet wide channel. This material could be dumped into the cells in the channel or another CAD site adjacent to Watchemocket Cove. The distance from the dredging site to the cells for the dredge material is on an average of one mile. The cost estimate for dredging and disposal in the cells is displayed on Table 1. The cost estimate for the construction of CAD cells for the unsuitable material and other cell material disposal is displayed on Table 1A, 1C, 1D & 1E.

b. Open Water

The total material proposed to be dredged from the channel is estimated to be 4,300,000 CY for a channel of 40 feet deep and 600 feet wide. Open water disposal for all the dredge material whether it is suitable or unsuitable to various open water disposal sites would be the least expensive disposal alternative and is displayed on Table 2.

Another option is to dispose the unsuitable material in cells either in the channel or adjacent to it at Watchemocket Cove CAD site. The unsuitable material is estimated to be about 1,200,000 CY and the remaining 3,100,000 CY is assumed to be suitable material. Due to the bulking effect, the volume of cell material excavated will be approximately 1,560,000 CY ( $1,200,000 \text{ CY} \times 1.3$ ) thereby increasing the total suitable material quantity to approximately 4,660,000 CY ( $1,560,000 \text{ CY} + 3,100,000 \text{ CY}$ ) if the CAD option is chosen.

In the in-channel CAD's all the material will be dumped from scows. At the Watchemocket Cove CAD, some of the material will be dumped here, as depths allow, and the remainder will be dredged from the scow and placed into the different sites. The suitable material (4,660,000 CY) could go to one of the seven open water sites located in Narragansett Bay and Rhode Island Sound. A total of 5,860,000 CY (1.2+1.56+3.1) suitable and unsuitable material would be dredged for the project as displayed on Table 1A for this option.

**c. Island Expansion and Salt Marsh Creation**

(1) Spar Island. There are a number of options proposed to increase the size of Spar Island. The first option would be to fill the area between the existing two islands to create a four acre island with the construction of earthen dikes or geotextile bags. Another option involves the creation of a 50-acre island with the construction of earthen dikes. The next option for Spar Island would be to create a 225-acre island with earthen dikes which could hold all the material from the proposed project. Circular geotube dikes would be used to laterally confine dredge material at the proposed sites to create a 740 acre island. One small island creation is also considered by barging the granular material (67,000CY) from the CAD cells to Spar Island. Excavation to create the access channel would be required. Cost estimates performed for these options are shown on Table 4A & 8.

(2) Green Island. This disposal site consists of 13 acres with an earthen dike or geotube dike for island expansion. A cost estimate performed for this facility is shown on Table 4A. The proposed facility could hold approximately 52,000 CY of dredge material with a sand cap, and 94,000 CY of dredge material without a sand cap. . One Small Island creation is also considered by barging the granular material (37,000CY) from the CAD cells to Green Island. Excavation to create the access channel would be required. Cost estimates performed for these options are shown on Table 4A & 8.

(3) Green Jacket Shoal. The disposal site consists of 43 acres with an earthen dike, salt marsh and sheet piles options. A cost estimate performed for these facilities is shown on Table 4 & 4A. The proposed facilities could hold approximately 659,000 CY for salt marsh creation and 943,000 CY of dredge material for the park development.

(4) Pomham Rocks. The disposal site consists of 18 acres with an earthen dike or geotube dike. A cost estimate performed for this facility is shown on Table 4. The proposed facility could hold approximately 203,000 CY of dredge material for salt marsh creation.

(5) Watchemocket Cove. To construct the salt marsh habitat, the area chosen would be diked and filled with suitable dredged material. The dike would involve either granular material or geotextile bags. A cost estimate was performed for the two facilities as shown on Table 4. The proposed facilities could hold approximately 208,000 CY and 239,000 CY of dredge material respectively.

(6) Jamestown Bride Reef. 69a. The area is a potential disposal site for the suitable dredged material. The geotextile bag would be used to contain the material before dumping into the ocean thereby creating a reef. The site could hold approximately 3,640,000 CY of dredged material (the site could be expanded if needed). The cost estimate is displayed on Table 4.

(7) Separation Zone 69b. The area is also a potential disposal site for the suitable dredged material. The geotextile bag is used to contain the material before dumping into the ocean thereby creating a reef. The site could hold approximately 3,640,000 CY of dredged material (this site could also be expanded if needed). The cost estimate is displayed on Table 4.

d. **Dewatering Facility**

(1) Fields Point The dewatering site consists of a 40-acre area constructed with a temporary earthen dike. A cost estimate was performed for this facility as shown on Table 5. The proposed facility could hold approximately 220,000 CY of wet dredge material for a period of time. The distances to the upland disposal site facilities from the Fields Point range from 9 miles to 15 miles. Bulking factor of 1.3 was considered for the soil used in handling and offloading.

e. **Upland Disposal Facility**

(1) Industrial Drive. The disposal site consists of a 29-acre upland disposal facility with an earthen dike. A cost estimate performed for this earthen dike facility, including transport, is shown on Table 5. The proposed facility could hold approximately 607,000 CY of dredge material if unlined or single lined, and 409,000 CY of dredge material if lined with a RI waste liner. The distance to the disposal site facility from the Fields Point dewatering facility is about 9 miles.

(2) Central. The disposal site consists of a 269-acre upland landfill. A cost estimate performed for this earthen dike facility, including transport, is shown on Table 5. We have assumed that the proposed facility could hold all of the dredged material estimated to be approximately 4,800,000 CY ( $4,000,000 \times 1.2$ ) taking the bulking factor into consideration. The landfill fee is quoted to be \$57/CY for disposal of the material. They would consider the material as solid waste. The distance to the landfill from the Fields Point dewatering facility is about 13 miles.

(3) Pawtucket Upland Site. The site is approximately 12 acres and varies in elevation. It was determined that soil quantities of 353,000 CY, 343,000 CY and 328,000 CY could be removed depending on dike crest elevation of 30, 35 or 40 respectively. Disposal area capacities for the various dike elevations would be 208,000 CY, 255,000 CY and 303,000 CY. An offloading facility at the shore would likely be designed for this site. Piping through the dike to the secondary settling basin or discharge point would be necessary for the drainage. A cost comparison performed for an earthen dike facility, and sheetpiles for bulkhead, including transport, is shown on Table 7.

4. **DREDGING ALTERNATIVES**

(1) Thirty seven feet deep/600 feet wide channel. This alternative consists of dredging the channel to 37 feet in depth rather than restoring the Congressionally authorized depth of 40 feet. Under this alternative, a total of 2.65 MCY ( $1.56 + 0.475 + 0.62$ ) of material would be removed from the channel and harbor, consisting of 2.18 ( $1.56 + 0.62$ ) MCY of suitable material and 0.48 MCY of unsuitable material. A cost estimate performed for this reduced dredging project is shown on Table 1B & 1C.

(2) Thirty seven feet deep/500 feet wide channel. This alternative involves dredging the channel to 500 feet of width rather than the Congressionally authorized 600-foot width, and restoring a depth of 40 feet. Under this alternative, a total of 2.3 MCY ( $1.2+0.65+0.48$ ) of material would be removed from the channel and harbor, consisting of 1.85MCY( $1.2+0.65$ ) of suitable material and 0.48 MCY of unsuitable material. A cost estimate performed for this reduced dredging project is shown on Table 1B & 1E.

(3) Forty feet deep/500 feet wide channel. This alternatives involves dredging the channel to only 500 feet of width rather than the Congressionally authorized 600 feet width. Under this alternative, a total of 5.1 MCY (1.2+2.4+1.56) of material would be removed from the channel and harbor, consisting of 3.96 MCY (2.4+1.56) of suitable material and 1.2 MCY of unsuitable material. A cost estimate performed for this reduced dredging project is shown on Table 1 & 1D.

(4) Reduced Dimensions Increment. This increment involves reducing the portion of the channel dredged to reflect changes in the use of the port. It can be applied with any of the alternatives described above. This increment would deduce the amount of material to be removed from the Federal channel and turning basin by 400,000 CY compared to the 40 feet deep 600 feet wide authorized project dimensions. The quantities and the cost of the dredge material would be reduced by 0.3 MCY(\$5.7M) of suitable material and 0.1 MCY (\$1.1 M) of unsuitable material.

TABLE 1

**COST OF DREDGING UNSUITABLE MATERIAL & PLACING IT INTO THE CAD  
WITH DIFFERENT NUMBERS OF DREDGES  
(40 feet deep, 500/600 feet width)**

<b>Dredging &amp; Disposal Alternative CAD &amp; CELL DISPOSAL</b>	<b>1 Distance Miles</b>	<b>2 Capacity MCY</b>	<b>3 Dredges #</b>	<b>4 Scows #</b>	<b>5 Unit cost \$/CY</b>	<b>6 Mob/Demob \$M</b>	<b>7 Time Mon</b>	<b>8 Total cost \$M</b>	<b>9 x 1.35 \$M</b>	<b>10 Final Cost \$/CY</b>
<b>In-channel</b>	1	1.2	1	2	6.9	1.6	7.9	9.9	13.3	11.1
<b>Watchemoket Cove, Site 150 CAD</b>	1	1.2	1	2	6.9	1.6	7.9	9.9	13.3	11.1
<b>In channel</b>	1	1.2	2	3	6.3	2.6	4.6	10.1	13.7	11.4
<b>Watchemoket Cove, Site 150 CAD</b>	1	1.2	2	3	6.3	2.6	4.6	10.1	13.7	11.4
<b>In Channel</b>	1	1.2	3	4	7.8	3.8	3.8	13.0	17.5	14.6
<b>Watchemoket Cove, Site 150 CAD</b>	1	1.2	3	4	7.8	3.8	3.8	13.0	17.5	14.6

1. Average distance from the dredging site to the disposal site
2. Quantity of the unsuitable material
3. Number of dredges used for comparison
4. Number of scows
5. Unit cost of dredging and disposal
6. Cost of Mob/Demob
7. Time of actual construction time in month
8. Total cost include mob/demob
9. Markup includes E&D, S&A, escalation, verification and contingency cost
10. Final unit cost per cubic yard of dredged material

**TABLE 1A**  
**TOTAL COST OF DREDGING AND DISPOSAL**  
**INCLUDING PLACING UNSUITABLE INTO THE CELL AND DISPOSAL OF SUITABLE MATERIAL FROM THE CAD**  
**(Two Dredges, 40 feet depth, 600 feet width)**

Dredging & Disposal Alternative CAD & Cell Construction*	1 Dist. Miles	2 Capacity MCY	3 Unit Cost \$/CY	4 CAP MCY	5 CAP C. \$M	6 Mob/Dem \$M	7 Sub T. \$M	8 x 1.35 \$M	9 Uns.Mtl. \$M	10 Total C. F. \$M	11 Cost \$/CY	12 Time Mon
In-channel CADs	15	3.1+1.56	8.5	0	0.0	2.6	42.2	57.0	13.7	70.7	15.2	19.4
In-channel CAD/C	15	2.9+1.79	8.5	0.23	2.0	2.6	44.2	59.7	13.7	73.4	15.8	19.4
Watchemoket Cove, Site 150 CAD	15	3.1+1.56	8.5	0	0.0	2.6	42.2	57.0	13.7	70.7	15.2	19.4
Watchemoket Cove, Site 150 CAD/C	15	2.9+1.64	8.5	0.18	1.5	2.6	42.4	57.3	13.7	71.0	15.7	19.4
In-channel CADs	30	3.1+1.56	11.5	0	0.0	2.6	56.1	75.8	13.7	89.5	19.2	19.7
In-channel CAD/C	30	2.9+1.79	11.5	0.23	2.0	2.6	58.2	78.6	13.7	92.3	19.8	19.7
Watchemoket Cove, Site 150 CAD	30	3.1+1.56	11.5	0	0.0	2.6	56.1	75.8	13.7	89.5	19.2	19.7
Watchemoket Cove, Site 150 CAD/C	30	2.9+1.64	11.5	0.18	1.5	2.6	56.0	75.6	13.7	89.3	19.7	19.7
In-channel CADs	40	3.1+1.56	13.3	0	0.0	2.6	64.5	87.2	13.7	100.9	21.6	19.9
In-channel CAD/C	40	2.9+1.79	13.3	0.23	2.0	2.6	67.0	90.4	13.7	104.1	22.2	19.9
Watchemoket Cove, Site 150 CAD	40	3.1+1.56	13.3	0	0.0	2.6	64.6	87.2	13.7	100.9	21.6	19.9
Watchemoket Cove, Site 150 CAD/C	40	2.9+1.64	13.3	0.18	1.5	2.6	64.1	86.5	13.7	100.2	22.1	19.9

1. Average distance from CAD Cell to open water site
2. Quantity of the clean dredge material from channel and cells
3. Unit cost of cell dredging
4. Material used for Cap
5. Cost of cap material same as cost to open water 15 miles distant
6. Mobilization and Demobilization cost based on historical data
7. Sub-total cost for cell dredging
8. Markup includes E&D,S&A,Escalation, verification and contingency
9. Cost of unsuitable material dredging and disposal from Table 1
10. Total cost in millions
11. Final unit cost per cubic yard of dredged material
12. Time of construction in months

\*- /C = with cap

**TABLE 1B (Option)**  
**TOTAL COST OF DREDGING UNSUITABLE MATERIAL & PLACING IT INTO THE CAD**  
**(37-foot Deep, 500/600 width Channel)**

<b>Dredging &amp; Disposal Alternative CAD &amp; Cell Construction*</b>	<b>1 Dist. Miles</b>	<b>2 Capacity MCY</b>	<b>3 Dredges #</b>	<b>4 Scows #</b>	<b>5 Unit Cost \$/CY</b>	<b>6 Mob/Dem \$M</b>	<b>7 Time Mon</b>	<b>8 Total Cost \$M</b>	<b>9 x 1.35 \$M</b>	<b>10 Final Cost \$/CY</b>
<b>In-channel CADs</b>	1	0.71	1	2	8.3	1.6	3.9	7.5	10.1	14.2
<b>Watchemoket Cove, Site 150 CAD</b>	1	0.71	1	2	8.3	1.6	3.9	7.5	10.1	14.2
<b>Watchemoket Cove, Site 150 CAD/C</b>	1	0.71	1	2	8.3	1.6	3.9	7.5	10.1	14.2
<b>In-channel CADs</b>	1	0.71	2	3	6.8	2.6	2.0	7.4	10.0	14.1
<b>Watchemoket Cove, Site 150 CAD</b>	1	0.71	2	3	6.8	2.6	2.0	7.4	10.0	14.1
<b>Watchemoket Cove, Site 150 CAD/C</b>	1	0.71	2	3	6.8	2.6	2.0	7.4	10.0	14.1
<b>In-channel CADs</b>	1	0.71	3	5	6.6	3.8	1.4	8.5	11.4	16.1
<b>Watchemoket Cove, Site 150 CAD</b>	1	0.71	3	5	6.6	3.8	1.4	8.5	11.4	16.1
<b>Watchemoket Cove, Site 150 CAD/C</b>	1	0.71	3	5	6.6	3.8	1.4	8.5	11.4	16.1

1. Average distance to CAD
2. Quantity of the unsuitable material dredged from channel
3. Number of Dredges
4. Number of Scows
5. Unit cost of dredging and disposal
6. Mobilization and Demobilization cost based on historical data
7. Time of actual construction in mon.
8. Total cost include mob/demob
9. Markup includes E&D, S&A, escalation, verification and contingency cost
10. Final unit cost per cubic yard of the dredged material

\*- /C = with cap



**TABLE 1C (option)**  
**TOTAL COST OF DREDGING AND DISPOSAL**  
**INCLUDING DISPOSAL OF SUITABLE MATERIAL FROM THE CAD**  
**37-Foot depth, 600-Foot width, two dredges**

<b>Dredging &amp; Disposal Alternative CAD &amp; Cell Construction*</b>	<b>1 Dist. Miles</b>	<b>2 Capacity MCY</b>	<b>3 Unit Cost \$/CY</b>	<b>4 CAP MCY</b>	<b>5 CAP C. \$M</b>	<b>6 Mob/Dem \$M</b>	<b>7 Sub T. \$M</b>	<b>8 x 1.35 \$M</b>	<b>9 Uns.Mtl. \$M</b>	<b>10 Total C. \$M</b>	<b>11 F. Cost \$/CY</b>	<b>12 Time Mon</b>
<b>In-channel CADs</b>	15	1.56+0.92	8.1	0.0	0	2.6	22.7	30.6	10.0	40.6	16.4	8.3
<b>In-channel CAD/C</b>	15	1.33+1.15	8.1	0.2	1.9	2.6	24.6	33.2	10.0	43.2	17.4	8.3
<b>Watchemoket Cove, Site 150 CAD</b>	15	1.56+0.62	8.1	0.0	0	2.6	20.2	27.3	10.0	37.3	17.1	8.3
<b>Watchemoket Cove, Site 150 CAD/C</b>	15	1.38+0.70	8.1	0.2	1.5	2.6	21.0	28.3	10.0	38.3	18.4	8.3
<b>In-channel CADs</b>	30	1.56+0.92	11.9	0.0	0	2.6	32.1	43.3	10.0	53.3	21.5	9.2
<b>In-channel CAD/C</b>	30	1.33+1.15	11.9	0.2	1.9	2.6	34.0	45.9	10.0	55.9	22.5	9.2
<b>Watchemoket Cove, Site 150 CAD</b>	30	1.56+0.62	11.9	0.0	0	2.6	28.5	38.5	10.0	48.5	22.2	9.2
<b>Watchemoket Cove, Site 150 CAD/C</b>	30	1.38+0.70	11.9	0.2	1.5	2.6	28.9	39.0	10.0	49.0	23.5	9.2
<b>In-channel CADs</b>	40	1.56+0.92	14.5	0.0	0	2.6	38.5	52.1	10.0	62.1	25.0	9.3
<b>In-channel CAD/C</b>	40	1.33+1.15	14.5	0.2	1.9	2.6	40.5	54.6	10.0	64.6	26.0	9.3
<b>Watchemoket Cove, Site 150 CAD</b>	40	1.56+0.62	14.5	0.0	0	2.6	34.2	46.2	10.0	56.2	25.8	9.3
<b>Watchemoket Cove, Site 150 CAD/C</b>	40	1.38+0.70	14.5	0.2	1.5	2.6	34.3	46.3	10.0	56.3	27.1	9.3

1. Average distance to open water disposal site
2. Quantity of the clean dredge material from channel and cell
3. Unit cost of cell dredging
4. Material used for Cap
5. Cost of cap material same as cost to open water 15 miles distant
6. Mobilization and Demobilization cost based on historical data
7. Sub-total cost for cell dredging
8. Markup includes E&D, S&A, escalation, verification and contingency
9. Cost of unsuitable material dredging and disposal from Table 1B
10. Total cost in millions
11. Final unit cost per cubic yard of cell or CAD dredged material
12. Time of actual construction in months

\*- /C = with cap

**TABLE 1D**  
**TOTAL COST OF DREDGING AND DISPOSAL**  
**INCLUDING DISPOSAL OF SUITABLE MATERIAL FROM THE CAD**  
**40 Feet depth, 500 feet width, two dredges**

Dredging & Disposal Alternative CAD & Cell Construction*	1 Dist. Miles	2 Capacity MCY	3 Unit Cost \$/CY	4 CAP MCY	5 CAP C. \$M	6 Mob/Dem \$M	7 Sub T. \$M	8 x 1.35 \$M	9 Uns.Mtl. \$M	10 Total C. F. \$M	11 Cost \$/CY	12 Time Mon
In-channel CADs	15	2.40+1.56	8.8	0.0	0.0	2.6	37.4	50.6	13.7	64.3	16.2	17.0
In-channel CAD/C	15	2.19+1.79	8.8	0.2	2.0	2.6	39.6	53.5	13.7	67.2	16.9	17.0
Watchemoket Cove, Site 150 CAD	15	2.40+1.56	8.8	0.0	0.0	2.6	37.4	50.6	13.7	64.3	16.2	17.0
Watchemoket Cove, Site 150 CAD/C	15	2.22+1.64	8.8	0.2	1.6	2.6	38.2	51.5	13.7	65.2	16.9	17.0
In-channel CADs	30	2.40+1.56	12.5	0.0	0.0	2.6	52.1	70.3	13.7	84.0	21.2	16.3
In-channel CAD/C	30	2.19+1.79	12.5	0.2	2.0	2.6	54.4	73.4	13.7	87.1	21.9	16.3
Watchemoket Cove, Site 150 CAD	30	2.40+1.56	12.5	0.0	0.0	2.6	52.1	70.3	13.7	84.0	21.2	16.3
Watchemoket Cove, Site 150 CAD/C	30	2.22+1.64	12.5	0.2	1.6	2.6	52.5	70.8	13.7	84.5	21.9	16.3
In-channel CADs	40	2.40+1.56	14.9	0.0	0.0	2.6	61.6	83.1	13.7	96.8	24.4	16.1
In-channel CAD/C	40	2.19+1.79	14.9	0.2	2.0	2.6	63.9	86.3	13.7	100.0	25.1	16.1
Watchemoket Cove, Site 150 CAD	40	2.40+1.56	14.9	0.0	0.0	2.6	61.6	83.1	13.7	96.8	24.4	16.1
Watchemoket Cove, Site 150 CAD/C	40	2.22+1.64	14.9	0.2	1.6	2.6	61.7	83.3	13.7	97.0	25.1	16.1

1. Average distance to open water disposal
  2. Quantity of the clean dredge material from channel and cells
  3. Unit cost of cell dredging
  4. Material used for Cap
  5. Cost of cap material same as cost to open water 15 miles distant
  6. Cost of mobilization and demobilization cost based on historical data
  7. Sub-total cost for cell dredging
  8. Markup includes E&D,S&A, escalation, verification and contingency
  9. Cost of unsuitable material dredging and disposal from Table 1B
  10. Total cost in millions
  11. Final cost per cubic yard of dredged material
  12. Time of actual construction in months
- \*- /C = with cap

**TABLE 1E (option)**  
**TOTAL COST OF DREDGING AND DISPOSAL**  
**INCLUDING DISPOSAL OF SUITABLE MATERIAL FROM THE CAD**  
**37-Foot Deep - 500 Feet Wide, two dredges**

Dredging & Disposal Alternative CAD & Cell Construction*	1 Dist. Miles	2 Capacity MCY	3 Unit Cost \$/CY	4 CAP MCY	5 CAP C. \$M	6 Mob/Dem \$M	7 Sub T. \$M	8 x 1.35 \$M	9 Uns.Mtl. \$M	10 Total C. F. \$M	11 Cost \$/CY	12 Time Mon
In-channel CADs	15	1.2+0.92	6.6	0	0	2.6	16.6	22.4	10.0	32.4	15.3	6.9
In-channel CAD/C	15	0.99+1.15	6.6	0.23	1.5	2.6	18.2	24.6	10.0	34.6	16.2	6.9
Watchemoket Cove, Site 150 CAD	15	1.2+0.62	6.6	0	0	2.6	14.6	19.7	10.0	29.7	16.3	6.9
Watchemoket Cove, Site 150 CAD/C	15	1.02+0.70	6.6	0.18	1.2	2.6	15.2	20.5	10.0	30.5	17.7	6.9
In-channel CADs	30	1.2+0.92	9.5	0	0	2.6	22.7	30.7	10.0	40.7	19.2	7.5
In-channel CAD/C	30	0.99+1.15	9.5	0.23	1.5	2.6	24.4	33.0	10.0	43.0	20.1	7.5
Watchemoket Cove, Site 150 CAD	30	1.2+0.62	9.5	0	0	2.6	19.9	26.9	10.0	36.9	20.3	7.5
Watchemoket Cove, Site 150 CAD/C	30	1.02+0.70	9.5	0.18	1.2	2.6	20.1	27.2	10.0	37.2	21.6	7.5
In-channel CADs	40	1.2+0.92	11.2	0	0	2.6	26.3	35.6	10.0	45.6	21.5	7.2
In-channel CAD/C	40	0.99+1.15	11.2	0.23	1.5	2.6	28.1	37.9	10.0	47.9	22.4	7.2
Watchemoket Cove, Site 150 CAD	40	1.2+0.62	11.2	0	0	2.6	23.0	31.0	10.0	41.0	22.5	7.2
Watchemoket Cove, Site 150 CAD/C	40	1.02+0.70	11.2	0.18	1.2	2.6	23.1	31.1	10.0	41.1	23.9	7.2

1. Average distance to open water disposal site
2. Quantity of the clean dredge material from channel and cells
3. Unit cost of cell dredging
4. Material used for Cap
5. Cost of cap material same as cost to open site 15 miles distant
6. Mobilization and Demobilization cost based on historical data
7. Sub-total cost for cell dredging
8. Markup includes E&D, S&A, escalation, verification and contingency
9. Cost of unsuitable material dredging and disposal from Table 1
10. Total cost in millions
11. Final unit cost per cubic yard of dedged material
12. Time of actual construction in months

\* - /C = with cap

**TABLE 2**

**COST OF DREDGING AND OPEN WATER DISPOSING ALL MATERIAL W/O CAD**  
(Two dredges)

<b>Open Water Disposal w/Cap</b>	<b>1 Distance Miles</b>	<b>2 capacity CY</b>	<b>3 Unit Cost \$/CY</b>	<b>4 Mob/Demob \$M</b>	<b>5 Total Cost \$M</b>	<b>6 Time Mon</b>	<b>7 x 1.35 \$M</b>	<b>8 Final Cost \$/CY</b>
Hog Island South, Site 3	15	4.3	10.0	2.6	45.6	16.8	61.6	14.3
Prudence Island Southwest, Site 157	15	4.3	10.0	2.6	45.6	16.8	61.6	14.3
Hope Island East, Site 158	15	4.3	10.0	2.6	45.6	16.8	61.6	14.3
Brenton Reef Site 18	30	4.3	11.1	2.6	48.6	16.8	67.9	15.8
Jamestown Br. Site 69a	40	4.3	12.1	2.6	54.6	17.6	73.7	17.2
Separation Zone Site 69b	40	4.3	12.1	2.6	54.6	17.6	73.7	17.2

1. Average distance to open water disposal site
2. Quantity of the total dredge material
3. Unit cost for dredging and disposing
4. Mobilization and Demobilization for dredging
5. Total cost of dredging and disposal
6. Time of actual construction time in months
7. Markup includes E&D, S&A, escalation, verification and contingency cost
8. Final unit cost per cubic yard of dredged material

**TABLE 2A**  
**TOTAL COST OF DREDGING AND DISPOSAL CAD MATERIAL BELOW 42 FEET (COST SHARING)**  
**(Two Dredges, 40 feet depth, 600 feet width)**

Dredging & Disposal Alternative CAD & Cell Construction*	1 Dist. Miles	2 Capacity MCY	3 Unit Cost \$/CY	4 CAP MCY	5 CAP C. \$M	6 Mob/Dem \$M	7 Sub T. \$M	8 x 1.35 \$M	9 F. Cost \$/CY	10 Time Mon
In-channel CADs	15	1.56	8.5	0.0	0.0	2.6	15.9	21.4	13.7	4.8
In-channel CAD/C	15	1.79	8.5	0.2	2.0	2.6	19.8	26.8	14.9	4.8
Watchemoket Cove, Site 150 CAD	15	1.56	8.5	0.0	0.0	2.6	15.9	21.4	13.7	4.8
Watchemoket Cove, Site 150 CAD/C	15	1.64	8.5	0.2	1.5	2.6	18.0	24.4	14.9	4.8
In-channel CADs	30	1.56	10.5	0.0	0.0	2.6	19.0	25.6	16.4	4.8
In-channel CAD/C	30	1.79	10.5	0.2	2.0	2.6	23.4	31.6	17.6	4.8
Watchemoket Cove, Site 150 CAD	30	1.56	10.5	0.0	0.0	2.6	19.0	25.6	16.4	4.8
Watchemoket Cove, Site 150 CAD/C	30	1.64	10.5	0.2	1.5	2.6	21.3	28.8	17.6	4.8
In-channel CADs	40	1.56	12.0	0.0	0.0	2.6	21.3	28.8	18.5	4.8
In-channel CAD/C	40	1.79	12.0	0.2	2.0	2.6	26.1	35.2	19.6	4.8
Watchemoket Cove, Site 150 CAD	40	1.56	12.0	0.0	0.0	2.6	21.3	28.8	18.5	4.8
Watchemoket Cove, Site 150 CAD/C	40	1.64	12.0	0.2	1.5	2.6	23.8	32.1	19.6	4.8

1. Average disposal distance
2. Quantity of the dredge material from cells
3. Unit cost of cell dredging
4. Material used for Cap
5. Cost of cap material same as cost to open water 15 miles distant
6. Mobilization and Demobilization cost based on historical data
7. Sub-total cost for cell dredging
8. Markup includes E&D,S&A,Escalation, Verification and Contingency
9. Final unit cost against the quantity of total dredge material
10. Time of construction in month

\* - /C = with cap



**TABLE 3**  
**TOTAL COST OF DREDGING AND DISPOSAL CAD MATERIAL BELOW 42 FEET FOR INCHANNEL**  
**(Two Dredges, 40 feet depth, 600 feet width)**

<b>Dredging &amp; Disposal Alternative CAD &amp; Cell Construction*</b>	<b>1 Dist. Miles</b>	<b>2 Capacity MCY</b>	<b>3 Unit Cost \$/CY</b>	<b>4 CAP MCY</b>	<b>5 CAP C. \$M</b>	<b>6 Mob/Dem \$M</b>	<b>7 Sub T. \$M</b>	<b>8 x 1.35 \$M</b>	<b>9 F. Cost \$/CY</b>	<b>10 Time Mon</b>
<b>In-channel CADs</b>	15	1.56	8.5	0.0	0.0	2.6	15.9	21.4	13.7	4.8
<b>In-channel CAD/C</b>	15	1.79	8.5	0.2	2.0	2.6	19.8	26.8	14.9	4.8
<b>Watchemoket Cove, Site 150 CAD</b>	15	1.56	8.5	0.0	0.0	2.6	15.9	21.4	13.7	4.8
<b>Watchemoket Cove, Site 150 CAD/C</b>	15	1.64	8.5	0.2	1.5	2.6	18.0	24.4	14.9	4.8
<b>In-channel CADs</b>	30	1.56	10.5	0.0	0.0	2.6	19.0	25.6	16.4	4.8
<b>In-channel CAD/C</b>	30	1.79	10.5	0.2	2.0	2.6	23.4	31.6	17.6	4.8
<b>Watchemoket Cove, Site 150 CAD</b>	30	1.56	10.5	0.0	0.0	2.6	19.0	25.6	16.4	4.8
<b>Watchemoket Cove, Site 150 CAD/C</b>	30	1.64	10.5	0.2	1.5	2.6	21.3	28.8	17.6	4.8
<b>In-channel CADs</b>	40	1.56	12.0	0.0	0.0	2.6	21.3	28.8	18.5	4.8
<b>In-channel CAD/C</b>	40	1.79	12.0	0.2	2.0	2.6	26.1	35.2	19.6	4.8
<b>Watchemoket Cove, Site 150 CAD</b>	40	1.56	12.0	0.0	0.0	2.6	21.3	28.8	18.5	4.8
<b>Watchemoket Cove, Site 150 CAD/C</b>	40	1.64	12.0	0.2	1.5	2.6	23.8	32.1	19.6	4.8

1. Average disposal distance from dredging site to the disposal site
  2. Quantity of the dredge material from cells
  3. Unit cost of cell dredging
  4. Material used for Cap
  5. Cost of cap material same as cost to open water 15 miles distant
  6. Mobilization and Demobilization cost based on historical data
  7. Sub-total cost for cell dredging
  8. Markup includes E&D, S&A, escalation, verification and contingency
  9. Final unit cost per cubic yard of dredged material
  10. Time of construction in months
- \*- /C = with Cap

**TABLE 3A**  
**TOTAL DREDGING AND DISPOSAL COST /CAD DISPOSAL**  
**FOR UNSUITABLE AND OPEN WATER DISPOSAL FOR CLEAN MATERIAL**  
**(40 Feet depth, 600 feet width, Two Dredges)**

Rhode Island Sound Open water disposal	1 Dist. Miles	2 Suitable MCY	3 Unit Cost \$/CY	4 CAP MCY	5 CAP C. \$M	6 Mob/Dem \$M	7 Sub C. \$M	8 x 1.35 \$M	9 Uns.Mtl. \$M	10 Total C. \$M	11 Final. Cost \$/CY	12 Time Mon
Brenton Reef Site18	30	3.1+1.56	11.5			2.6	56.2	75.9	13.7	89.6	19.2	19.7
Brenton Reef Site18 (48 Acre CAD)	30	3.1+2.02	11.5			2.6	61.5	83.0	13.7	96.7	18.9	19.7
Brenton Reef Site18 (CAD/Cap)	30	3.1+2.28	11.5	0.3	3	2.6	67.5	91.1	13.7	104.8	19.5	19.7
Jamestown Br.Reef Site 69a	40	3.1+1.56	13.3			2.6	64.6	87.2	13.7	100.9	21.6	19.9
Jamestown Br.Reef Site 69a (48 Acre CAD)	40	3.1+2.02	13.3			2.6	70.7	95.4	13.7	109.1	21.3	19.9
Jamestown Br.Reef Site 69a (CAD/Cap)	40	3.1+2.28	13.3	0.3	3	2.6	77.2	104.2	13.7	117.9	21.9	19.9
Separation Zone Site 69b	40	3.1+1.56	13.3			2.6	64.6	87.2	13.7	100.9	21.6	19.9
Separation Zone Site 69b(48 Acre CAD)	40	3.1+2.02	13.3			2.6	70.7	95.4	13.7	109.1	21.3	19.9
Separation Zone Site 69b (CAD/Cap)	40	3.1+2.28	13.3	0.3	3	2.6	77.2	104.2	13.7	117.9	21.9	19.9

1. Average distance to disposal site
2. Quantity of the clean dredge material from channel and cells
3. Unit cost of clean dredging
4. Sand cover used for Cap
5. Sand cover cost
6. Mobilization and Demobilization cost based on historical data
7. Sub-total cost for channel and cell dredging & disposal
8. Markup includes E&D,S&A,Escalation,verification and Contingency
9. Cost of unsuitable material dredge and placing from Table 1
10. Total maintenance dredging cost in million
11. Final unit cost against the quantity of total dredge material
12. Time of actual construction

**TABLE 4**  
**TOTAL COST OF DREDGING AND DISPOSAL FOR BENEFICIAL USE**  
**ALTERNATIVE USING SILT**

Beneficial Alternative	1	2	3	4	5	6	7	8	9	10	11	12
	Area	Capacity	Unit Cost	Mob/Dem	Sub C.	Dike/Tube	D.T. cost	Landscape	Total C.	x 1.35	F. Cost	Time
	Acres	K CY	\$/CY	\$ M	\$ M	KCY (\$25/CY)	\$ M	\$M (\$30000/A)	\$M	\$M	\$/CY	Mon
<b>Beneficial Use-Salt Marsh</b>												
Green Jacket Shoal, Site 60	43	659	20.0	2.6	15.8	260.0	6.5	1.3	23.6	31.9	48.3	18.0
Watchemocket Cove, Site 150	40	209	20.0	2.6	6.8	145.0	3.6	1.2	12.1	16.4	78.5	7.0
Pomham Rocks, Salt Marsh, Site 149	18	87	20.0	2.6	4.3	31.0	0.8	1.2	6.3	8.6	98.4	4.5
Pomham Rocks, Park, Site 149	18	203	20.0	2.6	6.7	68.0	1.7	0.5	8.9	12	59.2	6.0
<b>Geotextile Bag Reef</b>												
Jamestown Reef, Site 69a (Tube)	165	3640	13.3	2.6	51.0	3640.0	91.0		142.0	191.7	52.7	36.0
Separation Zone, Site 69b (Tube)	165	3640	13.3	2.6	51.0	3640.0	91.0		142.0	191.7	52.7	36.0

1. Site area
2. Material capacity in thousands of cubic yards
3. Unit cost of dredging & disposal including double handling
4. Cost for mobilization and demobilization of dredging equipment
5. Sub total cost of dredging
6. Volume of dike or geo-tube (complete dredge material)
7. Cost of dike or geo-tube
8. Landscape cost at \$30,000 per acre
9. Total cost for the alternative in millions of dollars
10. Markup includes E&D,S&A,Escalation, verification and Contingency
11. Final unit cost per cubic yard of material used
12. Time of actual construction in months

**TABLE 4A**  
**TOTAL COST OF DREDGING AND DISPOSAL FOR BENEFICIAL USE**  
**ALTERNATIVES USING SILT**

Dredging & Island Disposal & Beneficial Use	1 Area Acres	2 Capacity K CY	3 Unit Cost \$/CY	4 Mo/De \$ M	5 Sub C. \$ M	6 Dike/Tube KCY (\$25/CY)	7 D.T. cost \$ M	8 Bulkhead KSF (\$25/SF)	9 L. B. Cost \$M (\$30000/A)	10 Total C. \$M	11 x 1.35 \$M	12 F. Cost \$/CY	13 Time Mon
<b>Island Expansion</b>													
Greene Island, Site 60 (Dike)	13	37	20.0	1.6	2.3	15.0	0.40		0.40	3.1	4.2	114.5	2.7
Spar Island, Site 10 (Dike)	50	565	20.0	1.6	12.9	460.0	11.20		1.50	25.6	34.6	61.1	12.0
Spar Island, Site 10 (Dike)	225	4300	20.0	2.6	88.6	580.0	14.50		6.70	109.8	148.2	34.5	31.0
Spar Island, Site 10 (Tube)	740	4300	20.0	2.6	88.6	80.0	2.00			90.6	122.3	28.4	42.0
<b>Park Development</b>													
Bold Point Park, Site 62	43	937	20.0	2.6	21.3			320.0	8.00	29.3	39.6	42.2	15.0

1. Site area in acres
2. Disposal capacity for the alternative
3. Unit cost of dredging & disposal including double handling
4. Mobilization and demobilization of dredging
5. Sub total cost of dredging
6. Volume of dike or geo-Tube
7. Cost of dike or Geo-tube
8. Bulkhead
9. Landscape and bulk head cost in million
10. Total cost
- 11 Markup includes E&D, S&A, Escalation, verification and Contingency
12. Final cost per cubic yard of dredge material used
13. Time of actual construction in months

**TABLE 5**  
**Total cost of dredging and upland disposal**

<b>Dredge/Upland Disposal Alt.</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>
	<b>Area</b>	<b>Capacity</b>	<b>Unit C.</b>	<b>Dewatering</b>	<b>Hauling</b>	<b>Upland F.</b>	<b>Landfill Fee</b>	<b>Total cost</b>	<b>x 1.35</b>	<b>Final cost</b>	<b>Time</b>
	<b>Acre</b>	<b>K CY</b>	<b>\$/CY</b>	<b>\$/CY</b>	<b>\$/CY</b>	<b>\$/CY</b>	<b>\$/CY</b>	<b>\$ M</b>	<b>\$ M</b>	<b>\$/CY</b>	<b>Mon</b>
<b>Industrial Drive, Site 27</b>											
<b>No Liner</b>	29.0	607	8.5	6.0	5.0	12		19.1	25.8	42.5	15
<b>Thin Liner</b>	29.0	607	8.5	6.0	5.0	20		23.9	32.3	53.3	15
<b>RI SWL</b>	29.0	409	8.5	6.0	5.0	30		20.2	27.3	66.9	15
<b>Central Landfill, Site 74</b>	272.0	4800*	8.5	6.0	5.5		57.0	369.6	498.9	115.8	66

\* quantity (bulking and reducing) from original 4.3 MCY

1. Site area in acres
2. Disposal capacity for the alternative
3. Unit cost of dredging and disposal including double handling
4. Dewatering unit cost consists of \$1.5 soil handling, \$1.5 soil offloading and \$3 temp. dike times the disposal capacity
5. Unit cost for transport the disposal material from dewatering site to the upland facility
6. Upland dike facility unit cost times the disposal capacity
7. Landfill fee for the disposal material
8. Total cost of dredging and upland disposal
9. Markup includes E&D, S&A, Escalation, Verification and contingency cost
10. Final unit cost per cubic yard of dredged material
11. Time of actual construction in months



**TABLE 6**

**COST OF MULTIPLE DREDGING COMPARISON (ONE, TWO AND THREE DREDGES)**

<b>Open Water Disposal</b>	<b>1 Distance Miles</b>	<b>2 Quantity MCY</b>	<b>3 Dredges #</b>	<b>4 Scows #</b>	<b>5 Mob/Demob \$M</b>	<b>6 Unit cost \$/CY</b>	<b>7 Time Mon</b>	<b>8 Total cost \$M</b>	<b>9 x 1.35 \$M</b>	<b>10 Final Cost \$/CY</b>
<b>Hog Island South, Site 3</b>	15	4.3	1	5	1.6	13.60	33.6	60.0	81.2	18.9
<b>Hog Island South, Site 3</b>	15	4.3	2	6	2.6	10.00	16.8	43.0	61.6	14.3
<b>Hog Island South, Site 3</b>	15	4.3	3	7	3.8	8.70	11.2	41.2	55.6	12.9
<b>Rhode Island Sound</b>	30	4.3	1	5	1.6	14.80	33.6	65.2	88.1	20.5
<b>Rhode Island Sound</b>	30	4.3	2	6	2.6	11.10	16.8	50.3	67.9	15.8
<b>Rhode Island Sound</b>	30	4.3	3	7	3.8	11.00	13.5	51.1	69.0	16.0
<b>Rhode Island Sound</b>	40	4.3	1	5	1.6	15.50	33.6	68.2	92.1	21.4
<b>Rhode Island Sound</b>	40	4.3	2	6	2.6	12.10	17.6	54.2	73.7	17.2
<b>Rhode Island Sound</b>	40	4.3	3	7	3.8	13.70	17.6	62.7	84.6	19.7

1. Average distance to open water disposal site
2. Quantity of the total dredge material
3. Number of dredges used for comparison
4. Number of scows
5. Mobilization and demobilization for dredging
6. Unit cost of dredging and disposal
7. Time of actual construction time in month
8. Total cost include mob/demob
9. Markup includes E&D,S&A, escalation, verification and contingency cost
10. Final total cost per cubic yard of dredged material

**TABLE 7  
PAWTUCKET UPLAND SITE (Riverside Cemetary)  
COST OF DIKE CONSTRUCTION/LOADING**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CR HT FEET	DISPOSAL CY	EXC CY	COST MIL	DIKE CY	COST MIL	LINER MIL	DREDGE CY	COST MIL	WEIR/PIPE MIL	TRUCK MIL	W. TREAT MIL	Mitigate MIL	TOTAL MIL	X 1.35 ML	U.COST \$/CY
30	208000	353300	2.1	55100	1.2	0.8	30K	0.4	1.2	0.3	1.0	0.2	7.2	9.7	46.7
35	255000	343000	2.0	77800	1.7	1.0	30K	0.4	1.2	0.3	1.0	0.3	7.9	10.7	41.8
40	303000	328000	1.9	104000	2.3	1.2	30K	0.4	1.2	0.4	1.0	0.3	8.7	11.7	38.8

**COST OF SHEETPILE CONSTRUCTION/LOADING**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CR HT FEET	DISPOSAL CY	EXC CY	COST MIL	ST. AREA SF	COST MIL	LINER MIL	DREDGE CY	COST MIL	WEIR/PIPE MIL	TRUCK MIL	W.TREAT MIL	Mitigate MIL	TOTAL MIL	X 1.3 MU ML	U.COST \$/CY
30	265000	353300	2.10	30000	1.20	0.80	30K	0.4	1.2	0.3	1.0	0.2	7.2	9.7	36.7
35	345000	343000	2.00	49000	2.00	1.00	30K	0.4	1.2	0.3	1.0	0.3	8.2	11.1	32.1

- 1 Disposal material crest height of the dike or sheetpile
- 2 Dredged unsuitable materials from the Providence River
- 3 Excavated material from the upland site
- 4 Total cost for the excavated material
- 5 Quantity of the dike or area of the sheetpile
- 6 Total construction cost for the dike or sheetpile
- 7 Liner protection is R.I. Solid Waste Liner
- 8 Dredge quantity from the Seekonk River for the transport of the disposal material
- 9 Total cost for dredging the Seekonk River material
- 10 Weir, dock, ramp and piping system for the dike or sheetpile
- 11 Transport disposal material within the storage area
- 12 Water Treatment is desalinization treatment cost in million
- 13 Backfilling the Seekonk River
- 14 Total direct construction cost
- 15 Markup includes the construction cost, S&A, E&D, ESC and Contingency.
- 16 The unit cost per cubic yard of the disposal material at a particular crest height for the upland site

**TABLE 8**

**COST OF DREDGING CHANNEL AND ISLAND EXPANSION USING CAD CELL SAND**

<b>ISLANDS</b>	<b>1</b> <b>Distance</b> <b>MILE</b>	<b>2</b> <b>Capacity</b> <b>CY</b>	<b>3</b> <b>Unit Cost</b> <b>\$/CY</b>	<b>4</b> <b>Sub Total</b> <b>\$K</b>	<b>5</b> <b>Chan Exc</b> <b>KCY</b>	<b>6</b> <b>Unit Cost</b> <b>\$/CY</b>	<b>7</b> <b>Sub Total</b> <b>\$K</b>	<b>8</b> <b>Grading</b> <b>\$K</b> <b>\$3/CY</b>	<b>9</b> <b>Total Cost</b> <b>\$K</b>	<b>10</b> <b>x 1.35</b> <b>\$K</b>	<b>11</b> <b>Final Cost</b> <b>\$/CY</b>	<b>12</b> <b>Time</b> <b>Mon</b>
<b>GREENE ISLAND</b> (4 acre)	10	37000	8.5	314.5	28.0	10.0	280.0	111.0	705.50	952.4	25.7	1
<b>SPAR ISLAND</b> (4 acre)	15	67000	8.5	569.5	9.3	10.0	93.0	201.0	863.50	1165.7	17.4	2

1. Average distance from dredging area
2. Disposal site capacity in cubic yard
3. Unit cost of dredging and disposal
4. Sub-total cost of dredging and disposal
5. Quantity of channel excavation for disposal
6. Unit cost of channel excavation
7. Sub-total cost of channel excavation
8. Cost of grading during disposal at \$3 per cubic yard
9. Total cost of island expansion
10. Markup includes E&D, S&A, escalation, verification and contingency
11. Final unit cost per cubic yard of dredged material used
12. Time of actual construction in months

**TABLE 9**  
**P&W Dewatering/Storage Site**  
**COST OF DIKE CONSTRUCTION/LOADING**

1	2	3	4	5	6	7	8	9	10
Dike Height (feet)	Dredge Quantity (cy)	Dike Quantity (cy)	Dike Cost (\$ mil)	Hydroseed Cost (\$ mil)	Dewatering Structures Cost (\$ mil)	Subtotal Dike Construction (\$ mil)	Dredge & Transfer Cost (\$ mil)	Total Cost (\$ mil)	Unit Cost \$/cy
10	350,000	83,000	1.0	0.1	0.1	1.6	3.9	5.5	15.8

Q-21

Column	Notes
1	Average height of the dike
2	Quantity of sand and gravel to be placed at the site
3	Quantity of material excavated and moved on site to construct dikes
4	Cost of dike construction @ \$12/cy
5	Hydroseeding and slope protection
6	Cost of weir, piping and related structures
7	Sub total cost of column 4, 5, and 6 for cost sharing including mark ups (x1.35)
8	Cost of dredging from CAD cell and loading to dewatering site including mark ups (x1.35)
9	Total direct construction cost
10	The unit cost per cubic yard of the disposal material at a particular crest height

**TABLE 10**  
**Johnson & Wales Dewatering Reuse Site**  
**COST OF DIKE CONSTRUCTION/LOADING**

1	2	3	4	5	6	7	8	9	10
Dike Height (feet)	Dredge Quantity (cy)	Dike Quantity (cy)	Dike Cost (\$ mil)	Hydroseed Cost (\$ mil)	Dewatering Structures Cost (\$ mil)	Subtotal Dike Construction (\$ mil)	Dredge & Transfer Cost (\$ mil)	Total Cost (\$ mil)	Unit Cost \$/cy
10	250,000	49,300	0.6	0.1	0.1	1.1	2.8	3.9	15.5

Column	Notes
1	Average height of the dike
2	Quantity of sand and gravel to be placed at the site
3	Quantity of material to construct dikes
4	Cost of dike construction @ \$12/cy
5	Hydroseeding and slope protection
6	Cost of weir, piping and related structures
7	Sub total cost of column 4, 5, and 6 for cost sharing including mark ups (x1.35)
8	Cost of dredging from CAD cell and loading to dewatering site including mark ups (x1.35)
9	Total direct construction cost
10	The unit cost per cubic yard of the disposal material at a particular crest height